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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
CAO, HUEDUNG X

ART UNIT	PAPER NUMBER
2671	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/247,816	DORBIE, ANGUS	
	Examiner	Art Unit	
	Huedung X Cao	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 January 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) *14-18* is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

Attachment(s)

15) ☐ Notice of References Cited (PTO-892)
16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
18) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
19) ☐ Notice of Informal Patent Application (PTO-152)
20) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 4, 6, 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksicy (#5,977,980) in view of Duluk, Jr. (#5,596,686).

As per claim 1 Aleksicy teaches a method for culling occluded objects from an image being rendered into a frame buffer, the method, performed by host processor, comprising:

constructing a coarse Z-buffer, the coarse Z-buffer subdivide into a series of tiles, each tile having an associated depth value (col. 2, lines 25-31, and fig. 1). It is noted that Aleksicy does not explicitly disclose the coarse Z-buffer subdivide into a series of tiles; however, Aleksicy's computer display being devided into a plurality of tiles suggests the same idea of dividing the Z-buffer into a series of tiles. Furthermore Duluk teaches that the step of dividing Z-buffer into a series of tile is widely used in the art (Duluk, col. 35, lines 11-19; col. 99, lines 15-25). Thus, it would have been obvious to one of ordinary skill in the art to combine Duluk's teaching into Aleksicy's system by culling occluded objects to improve the efficiency of the video graphics.

updating the depth values of the coarse Z-buffer using Z information from the frame buffer (Aleknine, col. 2, lines 43-45); and

using the depth values to selectively discard the occluded objects from the image being rendered (Aleknine, col. 1, lines 36-39).

As per claim 4: the step of using the depth values to selectively discard the occluded objects further comprises:

constructing a surrogate volume for an object (Aleknine, col. 3, lines 25-26);and

comparing nearest Z-values of the surrogate volume to the depth value of a tile that includes the surrogate volume (Alekcisy, col. 3, line 33 to col. 4, line 7).

As per claim 6 is similar to claim 4 and adding the step of retrieving the greatest depth value from the set of tiles that are spanned by the surrogate volume (Alekcisy, col. 3, lines 33-40).

Claims 11-12 claim a system based on a method of claim 1; therefore, they are rejected under a similar reason.

Claim 13 claims a machine readable medium based on a method of claim 1; therefore, they are rejected under a similar reason.

3. Claims 2-3, 5, 7-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aleksicy (#5,977,980) in view of Duluk, Jr. (#5,596,686) and further in view of Ouaknine et al. (#6,091,422).

As per claim 2: updating depth values is performed synchronously as information in the frame buffer changes (Ouaknine, col. 7, lines 34-64). It would have been obvious to one of

ordinary skill in the art at the time the invention was made by updating depth values in order to discard occluded objects of the image.

As per claim 3: updating the depth values is performed asynchronously (Ouaknine, col. 5, lines 32-40).

As per claim 5 and similar claim 7: a method in claim 4 further comprise the step of transforming the surrogate volume from object space to eye space (Ouaknine, figures 7a-7c).

As per claim 8: constructing a lower resolution coarse Z-buffer, the lower resolution coarse Z-buffer subdivide into a series of tiles, each tile having an associated depth value; and updating the depth values of the lower resolution coarse Z-buffer using Z information from the frame buffer (Ouaknine, col. 8, lines 48-50).

As per claim 9: each tile in the lower resolution coarse Z-buffer covers the same screen area as each tile in the coarse Z-buffer (Ouaknine, col. 8, lines 48-64).

As per claim 10: the tiles in the lower resolution coarse Z-buffer are overlapping (Ouaknine, abstract).

4. Claims 14-16, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Green et al. (#5,579,455), hereinafter Green.

As per claim 14, and a similar claim 18, Green teaches a method for early culling of occluded objects, comprising:

ordering all objects, the objects being included in an image being rendered, according to their distance from eye point (col. 12, lines 51-59);

logically dividing area of the image into a coarse z-buffer, the coarse Z-buffer including a series of tiles, the tiles being arranged in a rectangular grid, wherein the grid may have different resolutions, and wherein each tiles has an associated depth value, the depth value being a Z-buffer value farthest from the eye that is included within that tile (col. 5, line 51-col. 6, line 8; col. 20, lines 19-26; col. 4, line 64-col. 5, line 14);

constructing a surrogate volume for each object of the image, wherein each surrogate volume is a three-dimensional object that is just large enough to contain the object being ordered and wherein each surrogate volume may span only one tile of an appropriate resolution (col. 10, lines 8-26);

determining a depth value of the surrogate volume that is nearest to eye of a viewer (figure 14);

determine depth value of the one tile that includes the surrogate volume (figure 14);

comparing the depth value of the surrogate volume versus the depth value of the tile including the surrogate volume (col. 6, lines 19-45);

culling the objects whose surrogate volume has a depth value farther from the eye than the depth value of the tile, including the surrogate volume, after a single comparison (col. 4, line 64-col. 5, line 14);

rendering the objects whose surrogate volume has depth value closer to the eye with the depth value of the tiles including the surrogate volume (col. 4, line 64-col. 5, line 14), it is noted that Green does not disclose rendering the objects whose surrogate volume has depth value equidistant to the eye with the depth value of the tile including the surrogate volume; however, it

would have been obvious to one of ordinary skill in the art at the time the invention was made to include this feature to make the system for efficient since it would have eliminated the time process for rendering the objects.

As per claim 15: wherein a surrogate volume may span several tiles and further comprising: comparing the depth value of the surrogate volume with each of the spanning tiles (col. 6, lines 19-45); culling the objects whose surrogate volume has a depth value father from the eye than the depth value of the tiles including the surrogate volume (col. 4, line 64-col. 5, line 14); rendering the objects whose surrogate volume has a depth values closer to the eye than the depth value of at least one of the tiles (col. 4, line 64-col. 5, line 14). It is noted that Green does not disclose rendering the objects whose surrogate volume has depth value equidistant to the eye with the depth value of the tile including the surrogate volume; however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include this feature to make the system for efficient since it would have eliminated the time process for rendering the objects.

As per claim 16: subdividing the objects that are not occluded into smaller objects; determining if the smaller objects are occluded (col. 6, lines 19-45).

Allowable Subject Matter

Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

5. Applicant's arguments filed 05/15/01 have been fully considered but they are not persuasive.

Applicant argues that (a) the cited references do not teach or suggest dividing the z-buffer into a series of tiles (b) a surrogate volume; (c) each tile in the lower resolution coarse z-buffer covers the same screen area as each tile in the coarse z-buffer.

Per (a) Aleksicy's computer display being devided into a plurality of tiles does suggest the same idea of dividing the Z-buffer into a series of tiles (col. 2, lines 25-31, and fig. 1). Furthermore Duluk's the render region is broken into tiles teaches that the step of dividing Z-buffer into a series of tile is widely used in the art (Duluk, col. 35, lines 11-19; col. 99, lines 15-25).

Per (b) Aleknine teaches surrogate volume in column 3, lines 25-26.

Per (c) Ouaknine teaches each tile in the lower resolution coarse Z-buffer covers the same screen area as each tile in the coarse Z-buffer in column 8, lines 48-64.

Inquires

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Huedung Cao** whose telephone number is **(703) 308-5024.**

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Mark Zimmerman,** can be reached at **(703) 305-9798**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

Huedung Cao
Patent Examiner

MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600